

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Water Resource Management, Bureau of Watershed Management

SOUTHWEST DISTRICT • TAMPA BAY BASIN

TMDL Report

Fecal Coliform TMDL for Roosevelt Basin: Channel 2 (WBID 1624)

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September 3, 2004

Acknowledgments

This study could not have been accomplished without significant contributions from staff in the Florida Department of Environmental Protection's Watershed Assessment Section. David Tyler provided the basin delineations and land use aggregations, and carried out much of the data gathering. Molly Davis with Region 4, U.S. Environmental Protection Agency, provided technical assistance.

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Contents

Chapter 1: INTRODUCTION	1
1.1 Purpose of Report	1
1.2 Identification of Waterbody	1
1.3 Background	4
Chapter 2: DESCRIPTION OF WATER QUALITY PROBLEM	5
2.1 Statutory Requirements and Rulemaking History	5
2.2 Information on Verified Impairment	5
Chapter 3: DESCRIPTION OF APPLICABLE WATER QUALITY STANDARDS AND TARGETS	7
3.1 Classification of the Waterbody and Criteria Applicable to the TMDL	7
3.2 Applicable Water Quality Standards and Numeric Water Quality Target	7
3.2.1 Fecal Coliform Criterion	7
Chapter 4: ASSESSMENT OF SOURCES	8
4.1 Types of Sources	8
4.2 Sources of Fecal Coliforms in the Roosevelt Basin: Channel 2 Watershed	8
4.2.1 Point Sources	8
4.2.2 Land Uses and Nonpoint Sources	9
Chapter 5: DETERMINATION OF ASSIMILATIVE CAPACITY	13
5.1 Determination of Loading Capacity	13
5.2 Data Used in the Determination of the TMDL	13
5.3 Calculation of Reduction Needed To Meet the Criterion	13
5.3.1 Attempts To Use the Load Duration Method	13
5.3.2 Calculation of Required Percent Reduction	14
5.4 Critical Conditions	15
5.5 Seasonal Variations	15
Chapter 6: DETERMINATION OF THE TMDL	16
6.1 Expression and Allocation of the TMDL	16
6.2 Load Allocation	17
6.3 Wasteload Allocation	17

6.3.1 NPDES Wastewater Discharges	17
6.3.2 NPDES Stormwater Discharges	17
6.4 Margin of Safety	17
Chapter 7: NEXT STEPS: IMPLEMENTATION PLAN DEVELOPMENT AND BEYOND	18
7.1 Basin Management Action Plan	18
References	19
Appendices	20
Appendix A: Background Information on Federal and State Stormwater Programs	20
Appendix B: Roosevelt Basin: Channel 2, WBID 1624, Sub-basin Coliform Bacteria Data	21

List of Tables

Table 2.1. Verified Impaired Segments in Roosevelt Basin: Channel 2, WBID 1624	6
Table 2.2. Summary Statistics for Fecal Coliform Data in Roosevelt Basin: Channel 2, WBID 1624	6
Table 4.1. Classification of Land Use Categories in Roosevelt Basin: Channel 2 Watershed	10
Table 5.1. Summary of Fecal Coliform Sample Exceedances for the Roosevelt Basin: Channel 2 Sub-basin, WBID 1624	14
Table 6.1. TMDL Components for Roosevelt Basin: Channel 2, WBID 1624	17

List of Figures

Figure 1.1. Location of Roosevelt Basin: Direct Runoff to Bay, WBID 1624, and Major Geopolitical Features in the Tampa Bay Basin	2
Figure 1.2. Roosevelt Basin: Channel 2 Sub-basin, WBID 1624, and Water Quality Monitoring Station	3
Figure 2.1. Fecal Coliforms in Roosevelt Basin: Channel 2, WBID 1624	6
Figure 4.1. Principal Land Uses in the Roosevelt Basin: Channel 2 Watershed	11
Figure 4.2. Population Density in Pinellas County, Florida	12

Web sites

Florida Department of Environmental Protection, Bureau of Watershed Management

TMDL Program

<http://www.dep.state.fl.us/water/tmdl/index.htm>

Identification of Impaired Surface Waters Rule

<http://www.dep.state.fl.us/water/tmdl/docs/AmendedIWR.pdf>

STORET Program

<http://www.dep.state.fl.us/water/storet/index.htm>

2002 305(b) Report

http://www.dep.state.fl.us/water/docs/2002_305b.pdf

Criteria for Surface Water Quality Classifications

<http://www.dep.state.fl.us/legal/rules/shared/62-302t.pdf>

Basin Status Report for the Tampa Bay Basin

http://www.dep.state.fl.us/water/tmdl/stat_rep.htm

Water Quality Assessment Report for the Tampa Bay Basin

http://www.dep.state.fl.us/water/tmdl/stat_rep.htm

Allocation Technical Advisory Committee (ATAC) Report

<http://www.dep.state.fl.us/water/tmdl/docs/Allocation.pdf>

U.S. Environmental Protection Agency

Region 4: Total Maximum Daily Loads in Florida

<http://www.epa.gov/region4/water/tmdl/florida/>

National STORET Program

<http://www.epa.gov/storet/>

Chapter 1: INTRODUCTION

1.1 Purpose of Report

This report presents the Total Maximum Daily Load (TMDL) for fecal coliform bacteria for the Roosevelt Basin: Channel 2 sub-basin in the Tampa Bay Basin. The channel was verified as impaired for fecal coliforms and was included on the Verified List of impaired waters for the Tampa Bay Basin that was adopted by Secretarial Order on August 28, 2002. The TMDL process quantifies the amount of a pollutant that can be assimilated in a waterbody, identifies the sources of the pollutant, and provides water quality targets needed to achieve compliance with applicable water quality standards, based on the relationship between pollution sources and instream water quality conditions. This TMDL establishes the allowable loadings to Roosevelt Basin: Channel 2 that would restore the waterbody so that it meets its applicable water quality criteria for fecal coliform bacteria.

1.2 Identification of Waterbody

The Roosevelt Basin: Channel 2 sub-basin, which covers 2 square miles, is located in central Pinellas County (**Figure 1.1**). Major centers of population near the watershed include Pinellas Park, a city of 45,658 near the southwest part of the watershed, and St. Petersburg, a city of 248,232 located to the south of the watershed (U.S. Census Bureau, 2004). Channel 2 originates west of I-275 and flows 2.2 miles to the northeast into Old Tampa Bay.

There are no individual permitted wastewater facilities in the Channel 2 sub-basin. Two closed landfills (Toytown Class I landfill and Struthers Class III landfill) are located in the sub-basin. The largest land cover category in the watershed is utilities, which includes solid waste disposal sites; this category makes up 35 percent of the area. The second largest land cover category is surface water, designated as reservoirs, which makes up about 16 percent of the area.

For assessment purposes, the Florida Department of Environmental Protection (Department) has divided the Coastal Old Tampa Bay Planning Unit into water assessment polygons with a unique **waterbody identification** (WBID) number for each watershed or stream reach. The Roosevelt Basin: Direct Runoff to Bay segment, which covers approximately 15 square miles, is designated as WBID 1624. Roosevelt Basin contains 3 major channels, each draining a sub-basin within WBID 1624. Channel 2, which covers approximately 2 square miles, drains the sub-basin located in southeast Roosevelt Basin, as shown in **Figure 1.2**.

This TMDL only addresses the fecal coliform impairment found in the Channel 2 sub-basin, because the water quality station that provided the data used to place the water segment on the Verified List of impaired waters (PCDEM 23-01) is located in Channel 2. Roosevelt Basin was placed on the Verified List for both fecal coliform and total coliform bacteria impairment. Five samples out of 20 exceeded the total coliform criterion of 2,400 counts/100 milliliters (mL). After additional review of the coliform data, it was determined that 1 station, 21FLGW7618, that was originally included in the watershed had been incorrectly assigned to WBID 1624. Only one total coliform sample from this station was included in the analysis, and the value exceeded the total coliform criterion of 2,400 counts/100mL. The removal of this station from the analysis means that the Channel 2 sub-basin does not have a sufficient number of samples exceeding

the total coliform criterion to verify impairment for this parameter. The removal of this station from the analysis, however, does not affect the listing for fecal coliform impairment.

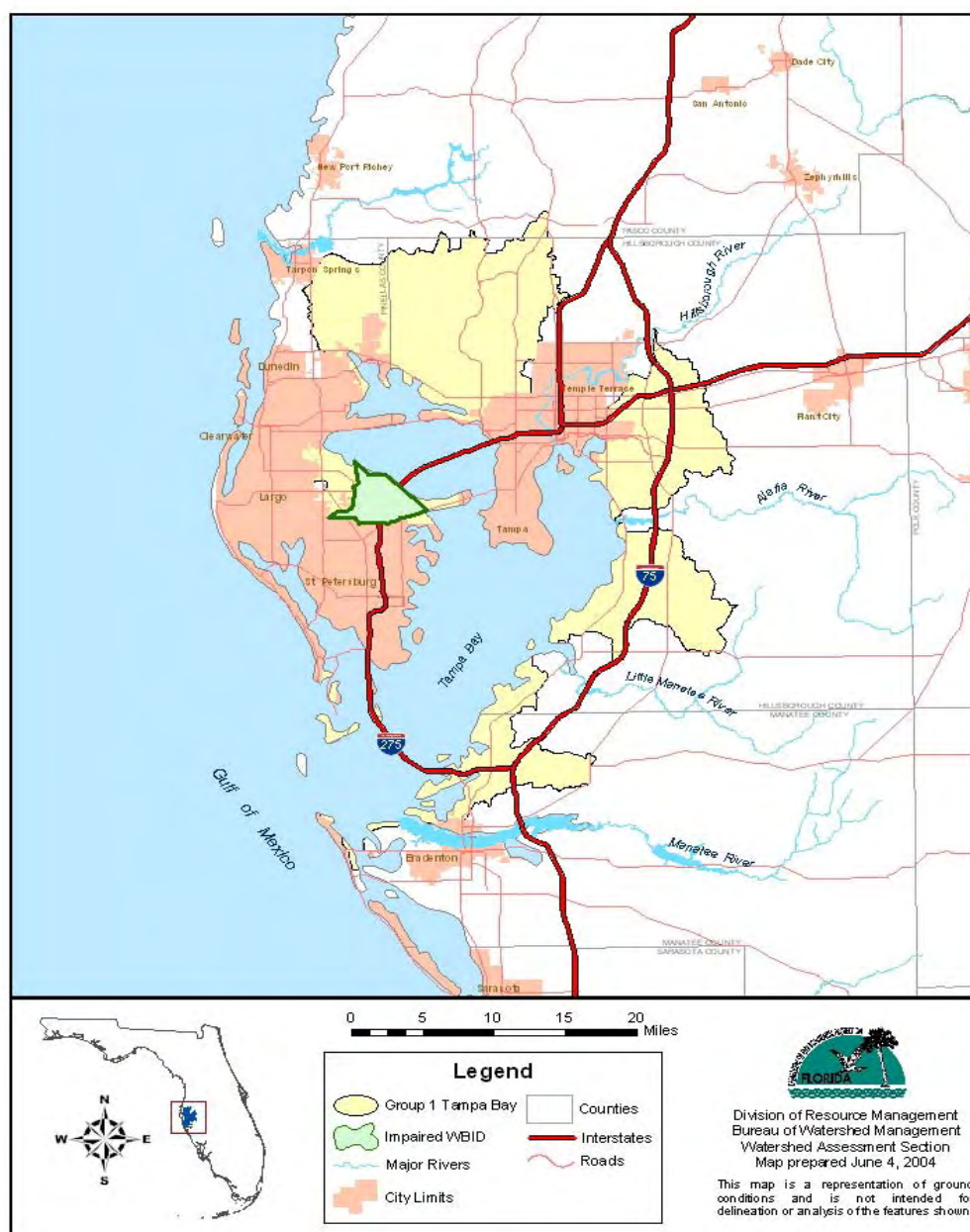


Figure 1.1. Location of Roosevelt Basin: Direct Runoff to Bay, WBID 1624, and Major Geopolitical Features in the Tampa Bay Basin

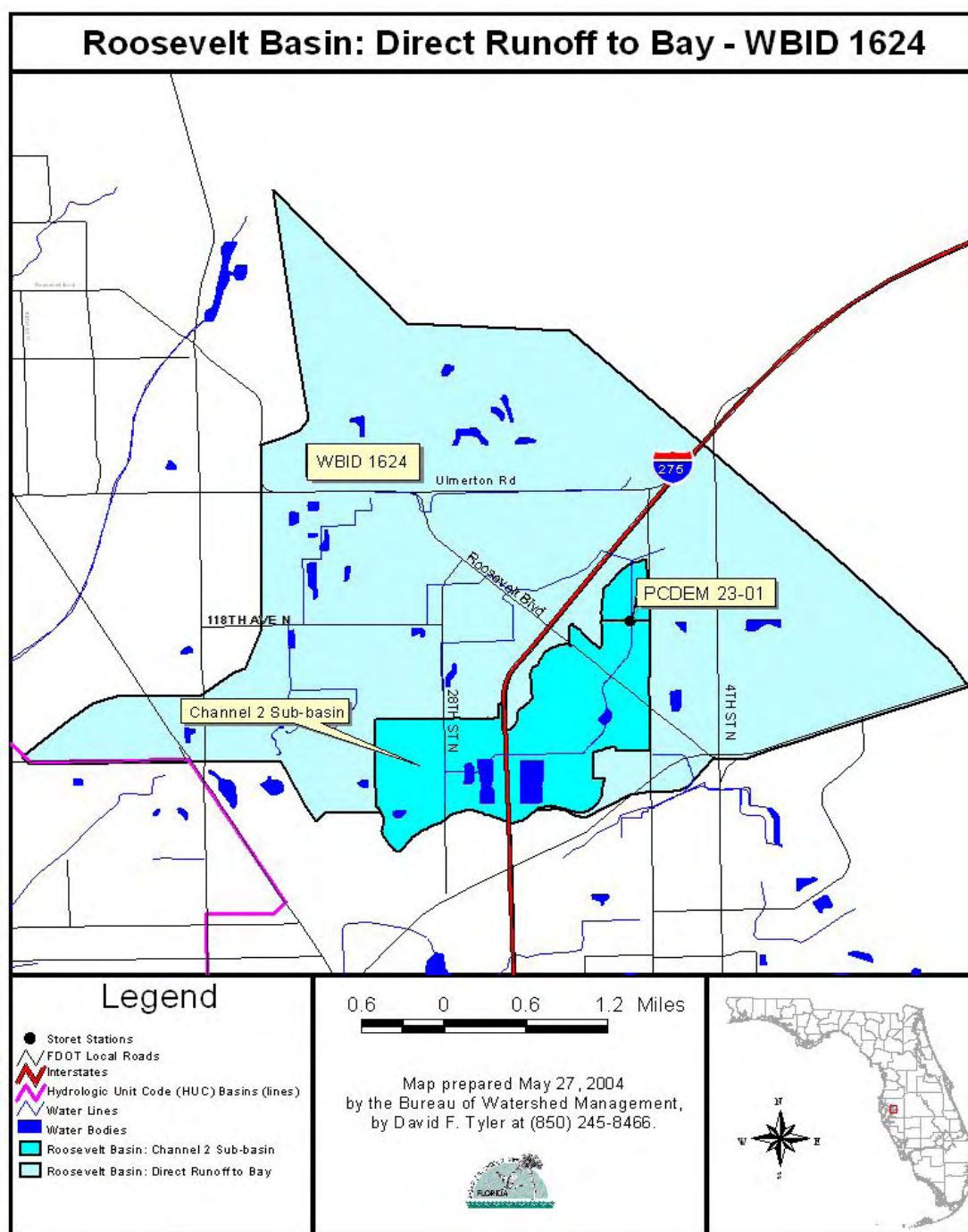


Figure 1.2. Roosevelt Basin: Channel 2 Sub-basin, WBID 1624, and Water Quality Monitoring Station

1.3 Background

This report was developed as part of the Department's watershed management approach for restoring and protecting state waters and addressing TMDL Program requirements. The watershed approach, which is implemented using a cyclical management process that rotates through the state's 52 river basins over a 5-year cycle, provides a framework for implementing the TMDL Program—related requirements of the 1972 federal Clean Water Act and the 1999 Florida Watershed Restoration Act (FWRA, Chapter 99-223, Laws of Florida).

A TMDL represents the maximum amount of a given pollutant that a waterbody can assimilate and still meet water quality standards, including its applicable water quality criteria and its designated uses. TMDLs are developed for waterbodies that are verified as not meeting their water quality standards. TMDLs provide important water quality restoration goals that will guide restoration activities. This TMDL Report will be followed by the development and implementation of a Basin Management Action Plan, or BMAP, to reduce the amount of fecal coliforms that caused the verified impairment of the Roosevelt Basin: Channel 2 sub-basin. These activities will depend heavily on the active participation of the Southwest Florida Water Management District (SWFWMD), local governments, businesses, and other stakeholders. The Department will work with these organizations and individuals to undertake or continue reductions in the discharge of pollutants and achieve the established TMDLs for impaired waterbodies.

Chapter 2: DESCRIPTION OF WATER QUALITY PROBLEM

2.1 Statutory Requirements and Rulemaking History

Section 303(d) of the federal Clean Water Act requires states to submit to the U.S. Environmental Protection Agency (EPA) a list of surface waters that do not meet applicable water quality standards (impaired waters) and establish a TMDL for each pollutant source in each of these impaired waters on a schedule. The Department has developed such lists, commonly referred to as 303(d) lists, since 1992. The list of impaired waters in each basin, referred to as the Verified List, is also required by the FWRA (Subsection 403.067[4]) Florida Statutes [F.S.]; the state's 303(d) list is amended annually to include basin updates.

Florida's 1998 303(d) list identified 47 waterbodies (WBIDs) in the Tampa Bay Basin, including Roosevelt Basin (WBID 1624). However, the FWRA (Section 403.067, F.S.) stated that all previous Florida 303(d) lists were for planning purposes only and directed the Department to develop, and adopt by rule, a new science-based methodology to identify impaired waters. After a long rule-making process, the Environmental Regulation Commission adopted the new methodology as Chapter 62-303, Florida Administrative Code (F.A.C.) (Identification of Impaired Surface Waters Rule, or IWR), in April 2001.

2.2 Information on Verified Impairment

The Department used the IWR methodology to assess water quality in Roosevelt Basin: Channel 2 and has verified the impairments listed in **Table 2.1**. Note that this TMDL report addresses only fecal coliforms. The fecal coliform impairment is based on the observation that 15 out of 22 samples collected during the verified period (January 1995 to June 2002) violated the state water quality criterion of 400 counts/100 mL (a 68 percent exceedance rate). **Figure 2.1** presents the individual fecal coliform results, and **Table 2.2** summarizes the results collected during the verification period. The fecal coliform counts showed a decreasing trend between 1995 and 1996, as shown in **Figure 2.1**; this decrease may have been influenced by rainfall. Rainfall, as recorded at the St. Petersburg National Weather Service station, was above average in 1995, an annual total of 65 inches, and below average in 1996, an annual total of 41 inches. The long-term average annual total rainfall in St. Petersburg is 53 inches.

The coliform data were collected by Pinellas County in 1995 and 1996 at Station PCDEM 23-01. After 1996, the county did not monitor for coliform bacteria. **Appendix B** provides the monitoring results for fecal and total coliform bacteria during the verified period. Because Station PCDEM 23-01 is located in the tidal area of the channel, sources upstream and downstream of the station can contribute to the coliform counts observed. Tidal influence in the channel ends approximately 500 feet upstream of the monitoring site.

Table 2.1. Verified Impaired Segments in Roosevelt Basin: Channel 2, WBID 1624

Parameters Causing Impairment	Priority for TMDL Development	Projected Year for TMDL Development
Dissolved Oxygen	High	2003
Fecal Coliforms	High	2003

Table 2.2. Summary Statistics for Fecal Coliform Data in Roosevelt Basin: Channel 2, WBID 1624

Water Quality Station	Percent Samples > 400 Counts/100mL	Total Number of Samples	Minimum Concentration (counts/100mL)	Mean Concentration (counts/100mL)	Maximum Concentration (counts/100mL)
21FLPDEM23-01	68	22	68	1,250	3,700

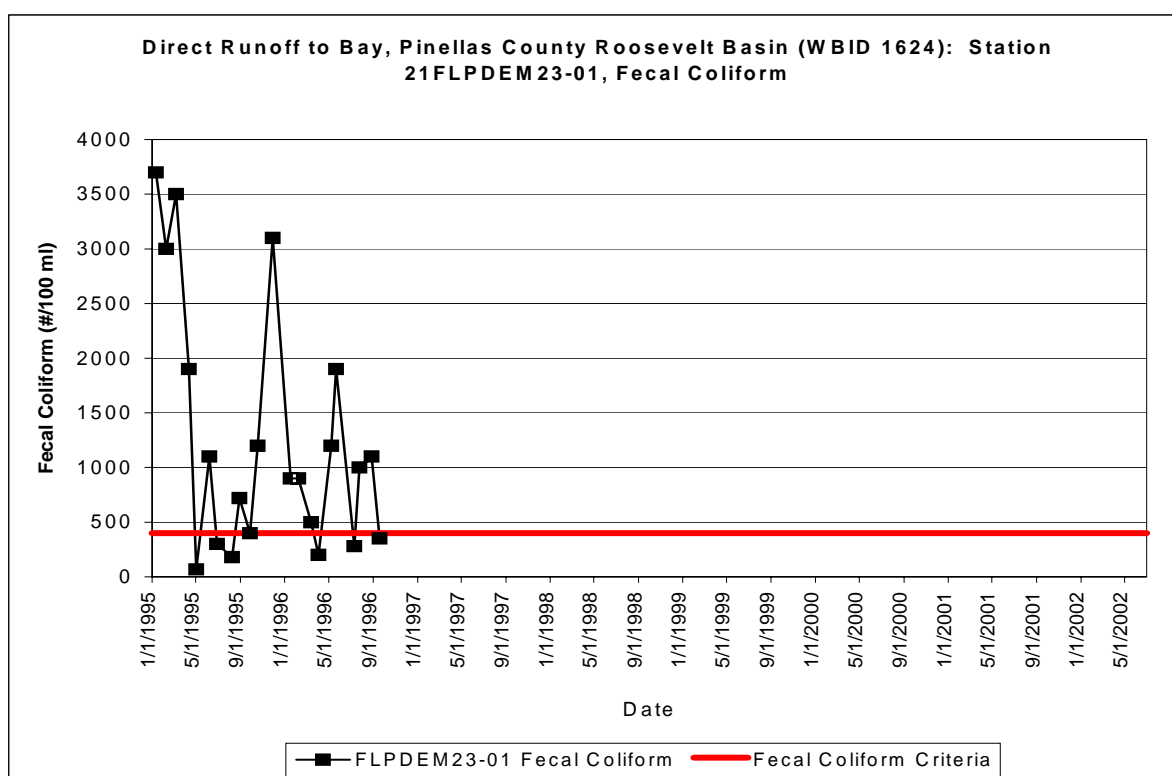


Figure 2.1. Fecal Coliforms in Roosevelt Basin: Channel 2, WBID 1624

Chapter 3: DESCRIPTION OF APPLICABLE WATER QUALITY STANDARDS AND TARGETS

3.1 Classification of the Waterbody and Criteria Applicable to the TMDL

Florida's surface waters are protected for five designated use classifications, as follows:

Class I	Potable water supplies
Class II	Shellfish propagation or harvesting
Class III	Recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife
Class IV	Agricultural water supplies
Class V	Navigation, utility, and industrial use (there are no state waters currently in this class)

Roosevelt Basin: Channel 2 is a Class III marine waterbody, with a designated use of recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife.

3.2 Applicable Water Quality Standards and Numeric Water Quality Target

3.2.1 Fecal Coliform Criterion

Numeric criteria for bacterial quality are expressed in terms of fecal coliform bacteria and total coliform bacteria concentrations. The fecal coliform water quality criterion for protection of Class III waters, as established by Chapter 62-302, F.A.C., states the following:

Fecal Coliform Bacteria:

The most probable number (MPN) or membrane filter (MF) counts per 100 mL of fecal coliform bacteria shall not exceed a monthly average of 200, nor exceed 400 in 10 percent of the samples, nor exceed 800 on any one day.

The criterion also states that monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30-day period.

During the development of percent reduction loads for the impaired water segment (as described in subsequent sections), there were insufficient data (fewer than 10 samples in a given month) available to evaluate the geometric mean criterion for fecal coliform bacteria. Therefore, the criterion selected for the TMDL is not to exceed 400 counts/100mL in 10 percent of the samples. The 10 percent exceedance allowed by the water quality criterion was not used directly in estimating the target load, but was included in the margin of safety for the TMDL (described in **Section 6.4**).

Chapter 4: ASSESSMENT OF SOURCES

4.1 Types of Sources

An important part of the TMDL analysis is the identification of pollutant source categories, source subcategories, or individual sources of coliforms in the Roosevelt Basin: Channel 2 sub-basin and the amount of pollutant loading contributed by each of these sources. Sources are broadly classified as either “point sources” or “nonpoint sources.” Historically, the term point source has meant discharges to surface waters that typically have a continuous flow via a discernable, confined, and discrete conveyance, such as a pipe. Domestic and industrial wastewater treatment facilities (WWTFs) are examples of traditional point sources. In contrast, the term “nonpoint sources” was used to describe intermittent, rainfall driven, diffuse sources of pollution associated with everyday human activities, including runoff from urban land uses, agriculture, silviculture, and mining; discharges from failing septic systems; and atmospheric deposition.

However, the 1987 amendments to the Clean Water Act redefined certain nonpoint sources of pollution as point sources subject to regulation under the EPA’s National Pollutant Discharge Elimination System (NPDES) Program. These nonpoint sources included certain urban stormwater discharges, including those from local government master drainage systems, construction sites over 5 acres, and a wide variety of industries (see **Appendix A** for background information on the federal and state stormwater programs).

To be consistent with Clean Water Act definitions, the term “point source” will be used to describe traditional point sources (such as domestic and industrial wastewater discharges) and stormwater systems requiring an NPDES stormwater permit when allocating pollutant load reductions required by a TMDL (see **Section 6.1**). However, the methodologies used to estimate nonpoint source loads do not distinguish between NPDES stormwater discharges and non-NPDES stormwater discharges, and as such, this source assessment section does not make any distinction between the two types of stormwater.

4.2 Sources of Fecal Coliforms in the Roosevelt Basin: Channel 2 Watershed

4.2.1 Point Sources

There are no permitted wastewater treatment facilities discharging coliform bacteria loads either directly or indirectly into the Channel 2 sub-basin.

Municipal Separate Storm Sewer System Permittees

Phase I or Phase II MS4s. Municipal separate storm sewer systems (MS4s) may also discharge pollutants to waterbodies in response to storm events. The EPA developed the federal NPDES stormwater permitting program in two phases. Phase I, promulgated in 1990, addresses large and medium MS4s located in incorporated places and counties with

populations of 100,000 or more; and 11 categories of industrial activities, one of which is large construction activity that disturbs 5 or more acres of land. Phase II, promulgated in 1999, addresses additional sources, including MS4s not regulated under Phase I, and small construction activity disturbing 1 through 5 acres. Phase II began permitting in 2003. Regulated Phase II MS4s, defined in Section 62-624.800, F.A.C., typically cover urbanized areas serving jurisdictions with a population of at least 10,000 and discharge into either Class I or Class II waters, or Outstanding Florida Waters. Within Roosevelt Basin: Channel 2, the stormwater collection systems owned and operated by Pinellas County and the Florida Department of Transportation, District 7, are covered by an NPDES MS4 permit (Permit Number FLS000005). At this time, no local governments in the watershed have applied for coverage under the Phase II NPDES MS4 permit.

4.2.2 Land Uses and Nonpoint Sources

Because no point source discharges were identified in Roosevelt Basin: Channel 2, the primary loadings of fecal coliform appear to be generated from nonpoint sources. Nonpoint sources of coliform bacteria typically involve the accumulation of coliform bacteria on land surfaces; these wash off as a result of storm events. Additional contributions may come from ground water, from pollutant sources such as flooding, failed septic tanks, and the improper land application of domestic wastewater residuals. For coliforms, an extended dry period followed by a storm event is usually the critical period when coliform levels in waterbodies exceed water quality criteria. Typical nonpoint sources of coliform bacteria include the following:

- Wildlife,
- Agricultural animals,
- Pets in residential areas,
- Onsite sewage treatment and disposal systems (septic tanks),
- Land application of domestic wastewater residuals,
- Urban development (outside of Phase I or II MS4 dischargers), and
- Leaking sanitary sewer lines.

Leaking sewer systems may be a potential source of coliform loadings. Additionally, wildlife on open land, wetlands, and wooded areas in the watershed may contribute to the elevated coliform levels. Runoff from residential areas can contribute to the coliform load; however, it is not expected to be a significant contributor, since residential land use covers only 2 percent of the sub-basin area. There is no rangeland or pasture in the watershed, and so agricultural animals are not considered a source contributing to the coliform loadings.

Land Uses

The spatial distribution and acreage of different land use categories in the watershed were identified using the 1999 land use coverage (scale 1:40,000) contained in the Department's geographic information system (GIS) library. Land use categories in the watershed were aggregated using the Level 1 through Level 3 codes. **Table 4.1** tabulates the land use cover for the Channel 2 sub-basin. **Figure 4.1** shows the acreage of the principal land uses in the watershed. Utilities and surface water reservoirs cover approximately 50 percent of the total watershed area. Commercial and industrial land use, combined, cover 22 percent of the area.

Table 4.1. Classification of Land Use Categories in the Roosevelt Basin: Channel 2 Watershed

Level 3	Land Use Attribute	Square Miles	Acres	Percent
8300	Utilities	0.703	449.8	35.27
5300	Reservoirs	0.328	209.7	16.45
1400	Commercial and services	0.225	144.3	11.31
1500	Industrial	0.214	137.2	10.75
8100	Transportation	0.110	70.4	5.52
4110	Pine flatwoods	0.108	69.0	5.41
1900	Open land	0.103	65.8	5.16
4340	Hardwood conifer mixed	0.077	49.2	3.86
1300	Residential high density	0.039	24.9	1.95
6120	Mangrove swamps	0.031	20.0	1.57
6410	Freshwater marshes	0.030	19.2	1.51
6300	Wetland forested mixed	0.016	10.4	0.81
3200	Shrub and brushland	0.008	5.3	0.42
Total		2.0	1,275.3	100

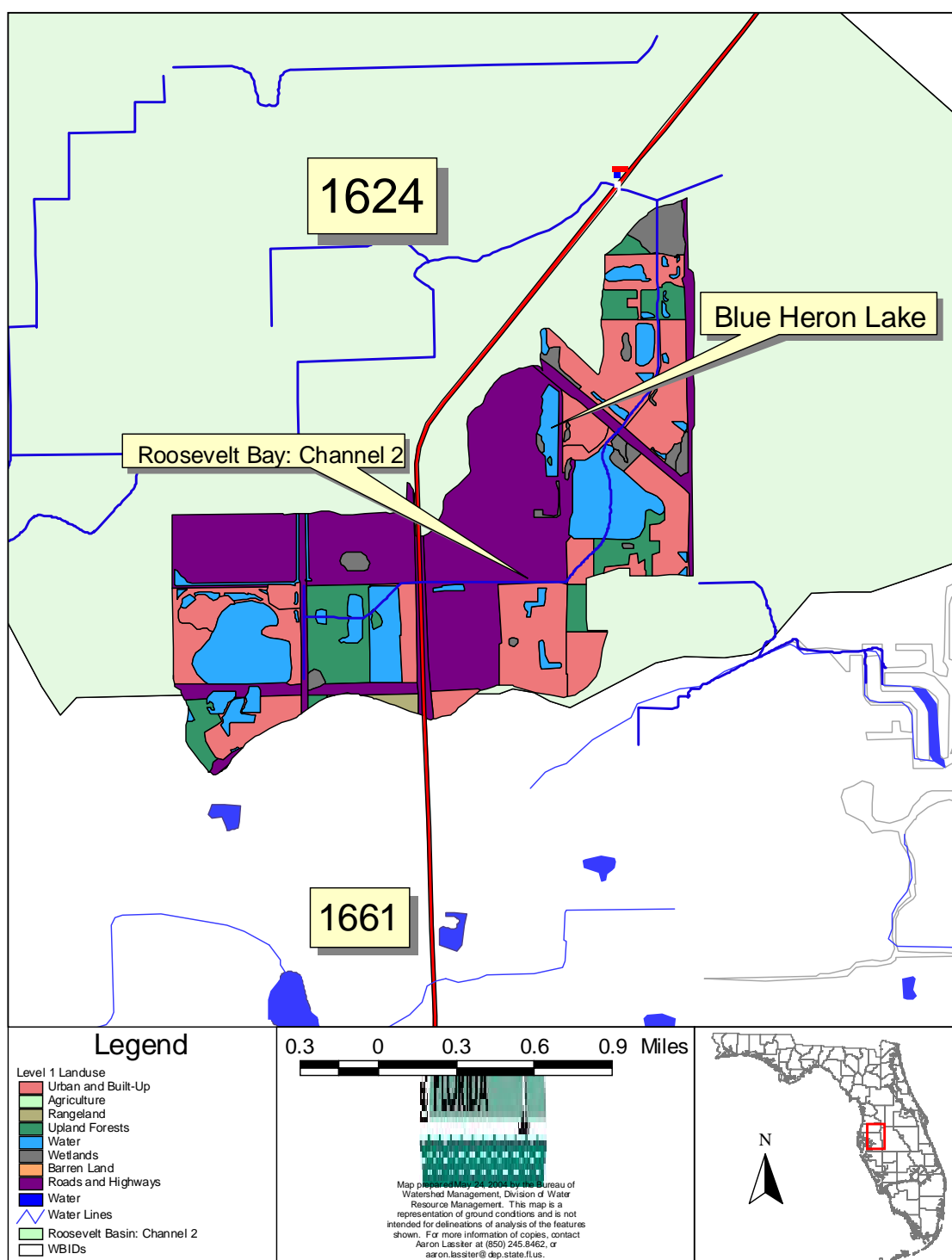


Figure 4.1. Principal Land Uses in the Roosevelt Basin: Channel 2 Watershed

Population

According to the U.S Census Bureau, the population density in and around WBID 1624 in the year 2000 was at or less than 3,292 people per square mile (**Figure 4.2**). The Bureau reports that in Pinellas County, which includes (but is not exclusive to) WBID 1624, the total population for 2000 was 921,482 with 481,573 housing units. For all of Pinellas County, the Bureau reports a housing density of 1,720 houses per square mile. Pinellas County had the highest housing density in Florida in 2000 (U.S. Census Bureau, 2004). In the Channel 2 sub-basin, however, only 2 percent of land use is residential.

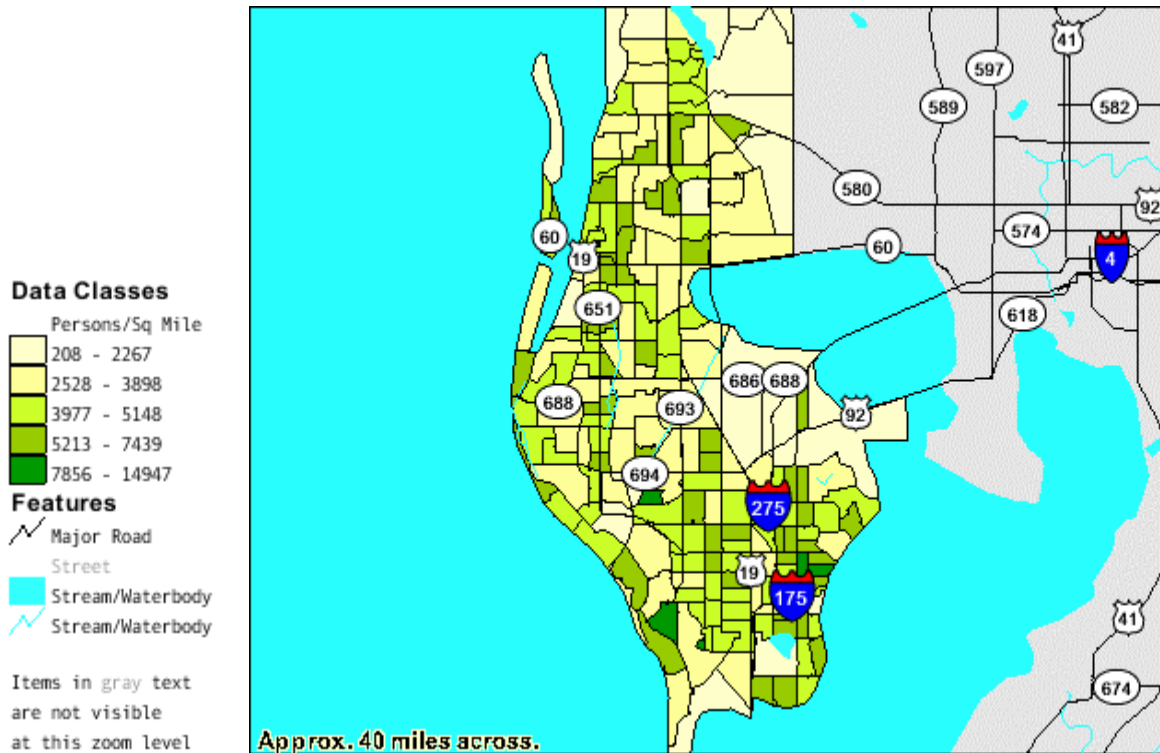


Figure 4.2. Population Density in Pinellas County, Florida

Septic Tanks

More than 97 percent of the residences within the county limits are connected to the wastewater treatment plant, with the rest utilizing septic tanks (U.S. Census Bureau, 2004). The Florida Department of Health (FDOH) reports that as of fiscal year 2001, there were 23,578 permitted septic tanks in Pinellas County (Florida Department of Health Web site, 2004). From fiscal years 1991 – 2001, 1,722 permits for repairs were issued, with 185 issued for repair in fiscal year 2001 (Florida Department of Health Web site, 2004). The data do not reflect septic tanks that may have been removed. The failure of septic tanks is not likely a significant source of coliform bacteria in the Channel 2 sub-basin, since there is only a small percentage of residential area. The residential area in the watershed is high-density residential, and these residences are typically connected to a central sewer system leading to a wastewater treatment facility.

Chapter 5: DETERMINATION OF ASSIMILATIVE CAPACITY

5.1 Determination of Loading Capacity

The TMDL process quantifies the amount of a pollutant that can be assimilated in a waterbody, identifies the source of the pollutant, and recommends regulatory or other actions to be taken to achieve compliance with applicable water quality standards based on the relationship between pollution sources and instream water quality conditions. The Roosevelt Basin: Channel 2 sub-basin fecal coliform TMDL is based on the “percent reduction” methodology. Under this method, the percent reduction needed to meet the applicable criterion is calculated for each measured value above the criterion, and then the median of the percent reductions is calculated. As described in Chapter 3, the criterion concentration of 400 counts/100 ml for fecal coliforms was utilized, as specified in Florida’s Surface Water Quality Standards.

5.2 Data Used in the Determination of the TMDL

One sampling station in the Channel 2 sub-basin had observations that were used in this TMDL. The data collector is the Pinellas County DEM, which maintains a routine sampling site described as “North side of 118th Avenue Bridge, west of 9th Street North, station number 23-01” (**Figure 1.2**). The site was sampled approximately monthly for coliform bacteria during the verified period from January 11, 1995, through December 17, 1996.

5.3 Calculation of Reduction Needed To Meet the Criterion

5.3.1 Attempts To Use the Load Duration Method

Coliform TMDLs are commonly developed using load duration curves. However, this method requires daily flow data (typically a U.S. Geological Survey [USGS] gage site in the watershed) to calculate coliform loads, and continuous flow data were not available for Channel 2 for the period when coliform data were collected.

Since there was no gaging station on the channel, the Department attempted to use the continuous flow record of a USGS gage on a similar, nearby creek. The Department selected USGS Gage 02307731, located in Allen Creek near Largo, Florida, because the drainage area above the gage, land use, topography, and geography were similar to those of the Channel 2 sub-basin. However, flow record periods did not correspond with the verified period sampling events. Additional USGS gage sites in the region were also evaluated, but either the flow record did not match the coliform bacteria sampling period at Station PCDEM 23-01 (1995 and 1996), or the drainage area ratios were too small or too large (< 0.5 or > 1.5). According to USGS methods, flows can be estimated at ungaged sites using drainage area ratios of a nearby gaged stream when the weighted drainage ratios of the 2 sites are within 0.5 to 1.5 (Ries and Friesz, 2000; U.S. Environmental Protection Agency, 2004). When flow data are not available,

the approach used to estimate a TMDL is based on the percent reduction required to reduce the coliform count exceedances to the water quality criterion.

5.3.2 Calculation of Required Percent Reduction

To calculate the required percent reduction in fecal coliforms needed to meet the criterion, the state's criterion for fecal coliforms (400 counts/100mL) was subtracted from each fecal coliform sample exceedance, divided by the sample result, and then multiplied by 100. This value provides the percent reduction required to achieve the instream concentration criterion established for fecal coliforms. The median value of the percent reduction values for each sample exceedance was then calculated and used as an overall percent reduction required for that water quality variable to meet quality standards. As shown in **Table 5.1**, a 66.7 percent reduction in fecal coliforms is required to achieve an instream concentration of 400 counts/100mL.

Table 5.1. Summary of Fecal Coliform Sample Exceedances for the Roosevelt Basin: Channel 2 Sub-basin, WBID 1624

Date	Station	Time	Result (counts/100mL)	Percent Reduction Needed
01/11/95	21FLPDEM23-01	0918	3,700	89.19
02/08/95	21FLPDEM23-01	0946	3,000	86.67
03/08/95	21FLPDEM23-01	0924	3,500	88.57
04/12/95	21FLPDEM23-01	0930	1,900	78.95
06/07/95	21FLPDEM23-01	0939	1,100	63.64
08/29/95	21FLPDEM23-01	0904	720	44.44
10/18/95	21FLPDEM23-01	1230	1,200	66.67
11/29/95	21FLPDEM23-01	0944	3,100	87.10
01/17/96	21FLPDEM23-01	0922	900	55.56
02/07/96	21FLPDEM23-01	0921	900	55.56
03/13/96	21FLPDEM23-01	0915	500	20.00
05/08/96	21FLPDEM23-01	0913	1,200	66.67
05/21/96	21FLPDEM23-01	0851	1,900	78.95
07/24/96	21FLPDEM23-01	900	1,000	60.00
08/27/96	21FLPDEM23-01	914	1,100	63.64
Median Percent Reduction TMDL				66.7

5.4 Critical Conditions

The critical condition for the coliform loading from nonpoint sources is typically an extended dry period followed by a rainfall runoff event. Nonpoint sources of coliform bacteria generally, but not always, involve the accumulation of coliform bacteria on land surfaces; these wash off as a result of storm events. Additional bacteria can also be contributed by wildlife and ground water polluted by sources such as failed septic tanks and central sewer system leaks/breaks. Due to the lack of flow data, a correlation between flow and coliform loading could not be made. While the critical conditions are not known, the determination of the required percent reduction is sufficiently protective, because the method analyzed all of the exceedances. Further, the approach is considered conservative because only the exceedances were used, which excludes conditions when the criterion is met in the stream.

5.5 Seasonal Variations

Seasonality was addressed by assessing water quality data associated with the impaired segment, based on values sampled from all four seasons in 1995 and 1996.

Chapter 6: DETERMINATION OF THE TMDL

6.1 Expression and Allocation of the TMDL

The objective of a TMDL is to provide a basis for allocating acceptable loads among all of the known pollutant sources in a watershed so that appropriate control measures can be implemented and water quality standards achieved. A TMDL is expressed as the sum of all point source loads (Waste Load Allocations, or WLAs), nonpoint source loads (Load Allocations, or LAs), and an appropriate margin of safety (MOS), which takes into account any uncertainty concerning the relationship between effluent limitations and water quality:

$$\text{TMDL} = \sum \text{WLAs} + \sum \text{LAs} + \text{MOS}$$

As discussed earlier, the WLA is broken out into separate subcategories for wastewater discharges and stormwater discharges regulated under the NPDES Program:

$$\text{TMDL} \cong \sum \text{WLAs}_{\text{wastewater}} + \sum \text{WLAs}_{\text{NPDES Stormwater}} + \sum \text{LAs} + \text{MOS}$$

It should be noted that the various components of the revised TMDL equation may not sum up to the value of the TMDL because (a) the WLA for NPDES stormwater is typically based on the percent reduction needed for nonpoint sources and is also accounted for within the LA, and (b) TMDL components can be expressed in different terms (for example, the WLA for stormwater is typically expressed as a percent reduction, and the WLA for wastewater is typically expressed as mass per day).

WLAs for stormwater discharges are typically expressed as “percent reduction” because it is very difficult to quantify the loads from MS4s (given the numerous discharge points) and to distinguish loads from MS4s from other nonpoint sources (given the nature of stormwater transport). The permitting of stormwater discharges also differs from the permitting of most wastewater point sources. Because stormwater discharges cannot be centrally collected, monitored, and treated, they are not subject to the same types of effluent limitations as wastewater facilities, and instead are required to meet a performance standard of providing treatment to the “maximum extent practical” through the implementation of BMPs.

This approach is consistent with federal regulations (40 CFR § 130.2[I]), which state that TMDLs can be expressed in terms of mass per time (e.g., pounds per day), toxicity, or other appropriate measure.

The fecal coliform TMDL for Roosevelt Basin: Channel 2 is expressed as the “median percent reduction” required to reduce the observed water quality exceedances to the state’s water quality criterion (**Table 6.1**). The percent reduction value for fecal coliforms was determined by taking the median of the percent reductions for each sample result that exceeds the criterion. The percent reduction was calculated as 66.7 percent to achieve an instream concentration of 400 counts/100mL.

Table 6.1. TMDL Components for Roosevelt Basin:
Channel 2, WBID 1624

Parameter	TMDL (Percent Reduction)	WLA		LA (Percent Reduction)†	MOS
		Wastewater (colonies/day)	NPDES Stormwater		
Fecal Coliforms	66.7	NA	66.7	66.7	Implicit

6.2 Load Allocation

Based on the percent reduction approach, a fecal coliform reduction of 66.7 percent is needed from nonpoint sources. It should be noted that the LA includes loading from stormwater dischargers regulated by the Department and the water management districts that are not part of the NPDES stormwater program (see **Appendix A**).

6.3 Wasteload Allocation

6.3.1 NPDES Wastewater Discharges

There are no NPDES permitted facilities that discharge coliform bacteria to surface waters in Roosevelt Basin: Channel 2. Thus, the wasteload allocation for wastewater facilities is not applicable. Any future wastewater facility permitted to discharge coliform bacteria in Roosevelt Basin: Channel 2 waters will be required to meet permit limits based on the applicable coliform criterion.

6.3.2 NPDES Stormwater Discharges

The WLA for stormwater discharges with an MS4 permit is a 66.7 percent reduction in current fecal coliform loading from the MS4. It should be noted that any MS4 permittee will only be responsible for reducing the loads associated with stormwater outfalls that it owns or otherwise has responsible control over, and it is not responsible for reducing other nonpoint source loads in its jurisdiction.

6.4 Margin of Safety

Consistent with the recommendations of the Allocation Technical Advisory Committee (Florida Department of Environmental Protection, February 2001), an implicit MOS was used in the development of this TMDL. An implicit MOS was provided by the conservative decisions associated with the analytical assumptions and the development of assimilative capacity. In addition, the Department used 400 MPN/100 mL of fecal coliform as the water quality target for each and every sampling event, instead of setting the criterion such that no more than 10 percent of the samples exceeded 400 MPN/100 mL.

Chapter 7: NEXT STEPS: IMPLEMENTATION PLAN DEVELOPMENT AND BEYOND

7.1 Basin Management Action Plan

Following the adoption of this TMDL by rule, the next step in the TMDL process is to develop an implementation plan for the TMDL, which will be a component of the Basin Management Action Plan (BMAP) for Roosevelt Basin: Channel 2. This document will be developed over the next year in cooperation with local stakeholders and will attempt to reach consensus on more detailed allocations and on how load reductions will be accomplished. The BMAP will include the following:

- Appropriate allocations among the affected parties,
- A description of the load reduction activities to be undertaken,
- Timetables for project implementation and completion,
- Funding mechanisms that may be utilized,
- Any applicable signed agreement,
- Local ordinances defining actions to be taken or prohibited,
- Local water quality standards, permits, or load limitation agreements, and
- Monitoring and follow-up measures.

References

Florida Administrative Code. *Chapter 62-302, Surface Water Quality Standards.*

Florida Administrative Code. *Chapter 62-303, Identification of Impaired Surface Waters.*

Florida Department of Environmental Protection. February 2001. *A Report to the Governor and the Legislature on the Allocation of Total Maximum Daily Loads in Florida.* Tallahassee, Florida: Bureau of Watershed Management.

Florida Department of Environmental Protection. November 2001. *Tampa Bay Basin Status Report.* Tallahassee, Florida. Available at http://www.dep.state.fl.us/water/tmdl/stat_rep.htm

Florida Department of Health Web site. 2004. Available at <http://www.doh.state.fl.us/>.

Florida Watershed Restoration Act. *Chapter 99-223, Laws of Florida.*

Ries and Friesz. 2000. U.S. Geological Survey; U.S. Environmental Protection Agency, 2004

Roehl, J. W. 1962. *Sediment Source Areas, Delivery Ratios, and Influencing Morphological Factors.* International Association of Scientific Hydrology. 59: 202-213. Symposium of Bari, October 1-8, 1962.

U. S. Census Bureau. 2004. Available at <http://www.census.gov/>.

U.S. Environmental Protection Agency. 2004. Region 4. Personal communication, Molly Davis.

User's Manual: Watershed Management Model, Version 4.1. 1998. Rouge River National Wet Weather Demonstration Project. Wayne County, Michigan. PRO-NPS-TM27.02.

Appendices

Appendix A: Background Information on Federal and State Stormwater Programs

In 1982, Florida became the first state in the country to implement statewide regulations to address the issue of nonpoint source pollution by requiring new development and redevelopment to treat stormwater before it is discharged. The Stormwater Rule, as authorized in Chapter 403, F.S., was established as a technology-based program that relies on the implementation of BMPs that are designed to achieve a specific level of treatment (i.e., performance standards) as set forth in Chapter 62-40, F.A.C.

The rule requires the state's water management districts (WMDs) to establish stormwater pollutant load reduction goals (PLRGs) and adopt them as part of a SWIM plan, other watershed plan, or rule. Stormwater PLRGs are a major component of the load allocation part of a TMDL. To date, stormwater PLRGs have been established for Tampa Bay, Lake Thonotosassa, the Winter Haven Chain of Lakes, the Everglades, Lake Okeechobee, and Lake Apopka. No PLRG has been developed for Newnans Lake at the time this report was developed.

In 1987, the U.S. Congress established Section 402(p) as part of the federal Clean Water Act Reauthorization. This section of the law amended the scope of the federal NPDES stormwater permitting program to designate certain stormwater discharges as "point sources" of pollution. These stormwater discharges include certain discharges that are associated with industrial activities designated by specific Standard Industrial Classification (SIC) codes, construction sites disturbing 5 or more acres of land, and master drainage systems of local governments with a population above 100,000, which are better known as municipal separate storm sewer systems (MS4s). However, because the master drainage systems of most local governments in Florida are interconnected, the EPA has implemented Phase 1 of the MS4 permitting program on a countywide basis, which brings in all cities (incorporated areas), Chapter 298 urban water control districts, and the Florida Department of Transportation throughout the 15 counties meeting the population criteria.

An important difference between the federal and state stormwater permitting programs is that the federal program covers both new and existing discharges, while the state program focuses on new discharges. Additionally, Phase II of the NPDES Program will expand the need for these permits to construction sites between 1 and 5 acres, and to local governments with as few as 10,000 people. The revised rules require that these additional activities obtain permits by 2003. While these urban stormwater discharges are now technically referred to as "point sources" for the purpose of regulation, they are still diffuse sources of pollution that cannot be easily collected and treated by a central treatment facility similar to other point sources of pollution, such as domestic and industrial wastewater discharges. The Department recently accepted delegation from the EPA for the stormwater part of the NPDES Program. It should be noted that most MS4 permits issued in Florida include a re-opener clause that allows permit revisions to implement TMDLs once they are formally adopted by rule.

Appendix B: Roosevelt Basin: Channel 2, WBID 1624, Sub-basin Coliform Bacteria Data

Station	Parameter	Date	Time	Result	Remark Code*
21FLPDEM23-01	FCOLI	1/11/1995	918	3700	Q
21FLPDEM23-01	FCOLI	2/8/1995	946	3000	
21FLPDEM23-01	FCOLI	3/8/1995	924	3500	
21FLPDEM23-01	FCOLI	4/12/1995	930	1900	
21FLPDEM23-01	FCOLI	5/2/1995	838	68	B
21FLPDEM23-01	FCOLI	6/7/1995	939	1100	
21FLPDEM23-01	FCOLI	6/28/1995	908	300	B
21FLPDEM23-01	FCOLI	8/9/1995	917	180	B
21FLPDEM23-01	FCOLI	8/29/1995	904	720	
21FLPDEM23-01	FCOLI	9/27/1995	905	400	B
21FLPDEM23-01	FCOLI	10/18/1995	1230	1200	
21FLPDEM23-01	FCOLI	11/29/1995	944	3100	
21FLPDEM23-01	FCOLI	1/17/1996	922	900	B
21FLPDEM23-01	FCOLI	2/7/1996	921	900	B
21FLPDEM23-01	FCOLI	3/13/1996	915	500	B
21FLPDEM23-01	FCOLI	4/3/1996	855	200	B
21FLPDEM23-01	FCOLI	5/8/1996	913	1200	
21FLPDEM23-01	FCOLI	5/21/1996	851	1900	B
21FLPDEM23-01	FCOLI	7/10/1996	1042	280	B
21FLPDEM23-01	FCOLI	7/24/1996	900	1000	
21FLPDEM23-01	FCOLI	8/27/1996	914	1100	
21FLPDEM23-01	FCOLI	9/18/1996	935	350	B
21FLPDEM23-01	TCOLI	1/11/1995	918	3600	Q
21FLPDEM23-01	TCOLI	2/8/1995	946	3200	
21FLPDEM23-01	TCOLI	4/12/1995	930	4500	
21FLPDEM23-01	TCOLI	5/2/1995	838	1000	
21FLPDEM23-01	TCOLI	6/7/1995	939	800	B
21FLPDEM23-01	TCOLI	6/28/1995	908	1600	
21FLPDEM23-01	TCOLI	8/9/1995	917	700	B
21FLPDEM23-01	TCOLI	8/29/1995	904	1300	
21FLPDEM23-01	TCOLI	9/27/1995	905	1200	
21FLPDEM23-01	TCOLI	11/29/1995	944	5500	
21FLPDEM23-01	TCOLI	1/17/1996	922	1200	
21FLPDEM23-01	TCOLI	2/7/1996	921	1000	
21FLPDEM23-01	TCOLI	3/13/1996	915	700	B
21FLPDEM23-01	TCOLI	4/3/1996	855	1000	
21FLPDEM23-01	TCOLI	5/8/1996	913	1700	
21FLPDEM23-01	TCOLI	7/10/1996	1042	1400	
21FLPDEM23-01	TCOLI	7/24/1996	900	2400	
21FLPDEM23-01	TCOLI	8/27/1996	914	2000	
21FLPDEM23-01	TCOLI	9/18/1996	935	400	B

* Rule 62-160 Data Qualifier Codes

- B.** Results based upon colony counts outside the acceptable range. This code applies to microbiological tests and specifically to membrane filter colony counts. The code is to be used if the colony count is generated from a plate in which the total number of coliform colonies is outside the method indicated ideal range. This code is not to be used if a 100 mL sample has been filtered and the colony count is less than the lower value of the ideal range.
- Q.** Sample held beyond the accepted holding time. This code shall be used if the value is derived from a sample that was prepared or analyzed after the approved holding time restrictions for sample preparation or analysis.



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